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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/065,772	11/18/2002	Hwang Choe	24-NS-6042	2406
23465 7590 04/11/2006 JOHN S. BEULICK C/O ARMSTRONG TEASDALE, LLP ONE METROPOLITAN SQUARE SUITE 2600 ST LOUIS, MO 63102-2740			EXAMINER GREENE, DANIEL LAWSON	
			ART UNIT	PAPER NUMBER
			3663	
DATE MAILED: 04/11/2006				

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/065,772

Applicant(s)

CHOE ET AL.

Examiner

Daniel L. Greene Jr.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 January 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 January 2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 1/30/2006 has been entered.

Drawings

2. New corrected drawings in compliance with 37 CFR 1.121(d) are required in this application because Figure 5 appears to be "Prior Art" as indicated in applicant's specification paragraphs 17 and 29, however said Figure 5 is NOT labeled as "Prior Art". Applicant is advised to employ the services of a competent patent draftsman outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

3. Applicant's Traversal to the requirement for corrected drawings is noted, however it is immaterial whether another Examiner accepted previous drawings. The Fact that the USPTO draftsman objected to the drawings required appropriate correction. The Office appreciates applicant submitting replacement drawings and regrets any inconvenience to applicant.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

- 4. Claim 1 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.**

The addition of the limitation "separate" is considered new matter in that it is not seen wherein the specification as filed discloses exactly what all is meant and encompassed by the limitation a "separate" means of controlling a flow of coolant or what exactly applicant intends the limitation "separate" to encompass.

- 5. Claims 1-22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.**

- a. Claim 1 is vague, indefinite and incomplete in what all is meant by and encompassed by the phrase "a separate means of controlling a flow of coolant"

(Underlining added) because the claim does not disclosed how and in what manner the "means" is "separate" nor what it is "separate" from. Accordingly, the metes and bounds of the claim are undefined.

b. Claims 1-22 are is vague, indefinite and incomplete in what all is meant by and encompassed by the phrase "main coolant flow channel", because applicant's arguments received 1/30/2006, see the paragraph spanning pages 11 and 12, disagree with the Examiners contention that "Patterson clearly discloses a plurality of coolant orifices located in the inlet of the main coolant flow channel of each respective fuel assembly". Since applicant has pointed out that there are multiple interpretations of the limitation "main coolant flow channel" the metes and bounds of the claims are undefined because the claims do not specifically and explicitly recited exactly what is considered to be said "main coolant flow channel".

Claim Rejections - 35 USC § 102

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

6. Applicant's inventive concept is directed towards utilizing various sized orificed apparatus' to control the amount of coolant flowing through a nuclear fuel assembly. Applicant further discloses that said apparatus are capable of being placed within and removed from the inlet of the main coolant channel of said fuel assemblies. Applicant also discloses that said apparatus is capable of adjusting the flow profile of a nuclear

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reactor core into three discrete "regions" of flow rates, with each region having substantially the same flow rate, with each flow rate different from the other.

In the nuclear art, the concept of altering the coolant flow rate of various regions within a nuclear reactor core, including the fuel cells either individually or in groups is notoriously old and well known, as such is used throughout the nuclear industry to alter neutron moderating effects, neutron reflection, thermal margins, reactivity, thermal stripping, etc., etc. etc.

As further expounded upon below, methods of controlling the flow through each regions fuel assembly has been accomplished in the art through the use of many different methods including the use of orifice plates, orifice assemblies, variable pump flow, variable entrance constriction devices, bypass devices, intermediate plenums, etc., etc. etc. As stated in previous office actions, there is no novelty in simply taking a known structure and moving it from one place to another, especially when it performs the same function, i.e. taking an orificed plate from the inlet plenum and placing it instead on/in the fuel assembly itself. As explained in detail below, applicant's inventive concept is nothing more than the use of commonly known techniques of flow control already utilized in the nuclear art as shown by ANY of Church, Congdon, Carelli, Otsuji, Zmola et al., other art of record, etc.

7. Claims 1-7, and 13-16 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,198,185 to Church.

Church discloses a nuclear reactor core comprising a plurality of fuel assemblies (18), each said fuel assembly inherently comprising a lower tie plate (because lower tie plates are known in the art as being utilized to hold each individual fuel rod in place to constitute a fuel assembly) and a main coolant flow channel comprising an inlet and a coolant (column 3 line 30) flowing through said plurality of fuel assemblies said plurality of fuel assemblies arranged into at least three regions (Figures 1 and 2) within said core, each said main coolant flow channel further comprising a separate means (24, 26, 28, 70, 74, 76, 78, etc.) of controlling a flow of coolant through said main coolant flow channel so that the flow of coolant through said main coolant flow channels of said fuel assemblies located in a particular region are substantially the same, and that the coolant flow through said fuel assemblies in each said region is different from the coolant flow through said fuel assemblies in each other region, said means of controlling said flow of coolant through said main coolant flow channel located in said inlet of said main coolant flow channel, in for example, the abstract, figures 1 and 2, column 1 lines 15-23, 40+, column 3 lines 27+, etc.

Church discusses the flow rates, sizes, shapes, numbers, arrangements of the holes/orifices as set forth in applicant's claims in, for example column 4 lines 26-50.

8. Claims 1-22 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,149,491 to Congdon et al. (Congdon).

Congdon discloses a nuclear reactor core comprising a plurality of fuel assemblies (130), each said fuel assembly inherently comprising a lower tie plate (because lower tie plates are known in the art as being utilized to hold each individual fuel rod in place to constitute a fuel assembly) and a main coolant flow channel comprising an inlet and a coolant flowing through said plurality of fuel assemblies (Figure 1) said plurality of fuel assemblies arranged into at least three regions (Figure 2) within said core, each said main coolant flow channel further comprising a detachably coupled to the lower end of the lower tie plate of the fuel assembly separate means (242, 244, 246, 126, etc.) of controlling a flow of coolant through said main coolant flow channel so that the flow of coolant through said main coolant flow channels of said fuel assemblies located in a particular region are substantially the same, and that the coolant flow through said fuel assemblies in each said region is different from the coolant flow through said fuel assemblies in each other region, said means of controlling said flow of coolant through said main coolant flow channel located in said inlet of said main coolant flow channel, in for example, the abstract, figures 1 and 2, column 4 lines 17-19, 26-43, column 5 lines 14-40, Claims 1-6, etc.

Congdon discloses the flow rates, sizes, shapes, numbers, arrangements of the holes/orifices as set forth in applicant's claims in, for example, column 5 lines 13-25.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

9. Claims 1 to 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Patterson (U.S. Patent 3,892,625) in view of JP 06-289178 (Yasuyaki) for the reasons set forth in section 3 of the previous office action dated 8/30/2005, which in turn refers to for the reasons set forth in section 3 of the previous office action dated 10/15/2004 (reproduced below for applicants benefit).

Applicant amended the claims to include the limitation “a “separate” means of controlling a flow...” The limitation “separate” has been considered as reading on a means for controlling a flow that is “separate” from the main coolant flow channel. In this regard, it is noted that the means for controlling flow in Patterson is indeed “separate” from the main coolant channel as can be seen in figures 2 and 3, in that the means for controlling flow (e.g. item 59 in figure 3) is separate from the main coolant channel and removable/detachable, as it is held in place by spring (26).

The primary reference discloses a fast reactor fuel assembly flow orifice arrangement, comprising a nuclear reactor core (item 2), a plurality of fuel assemblies (items 19), each of the said assemblies incorporating a flow / opening / channel (items 20), a lower tie-plate / support structure (items 102), the said fuel assemblies configured in a plurality of core flow regions (Figure 1), and said core

regions configured to specific core coolant flows (see for example, Column 3, lines 18-26), and each of the said fuel assemblies provided with orifice plate comprising a diameter (e.g., items 31, 104, 52) and said orifice plates arranged in a detachable manner (see Column 5, lines 48-61, also reads on cutting off the ends of the fuel assemblies and welding on new ones with different orifices). Relating to claim 2, the said orifice plates are located in the said fuel assembly flow channel, relating to claims 3, 4, 9, 10, and 22, the said flow orifice plates are sized to maintain coolant flow rates in the core regions depicted in Figure 1 (see Column 6, lines 24-47), relating to claims 5-7, 14-16, 19-21, the reference discloses that the variations between core region coolant flows that read on the cited claims (see Column 4, lines 40+, Column 7, lines 12-22), relating to claims 8, 11, 12, 17, the reference discloses the said orifice plates are arranged to detachably coupled to the lower fuel assembly structure (see Column 5, lines 48-62).

The primary reference discloses the claimed invention except for citing three core flow regions. The secondary reference discloses that it is well known in the fast reactor art to arrange nuclear cores with tripartite flow rate regions.

It would have been obvious to one of ordinary skill in the nuclear fuel art at the time of the invention to have specified that the flow regions disclosed in the primary reference (see Patterson, Column 3, lines 28+, Column 4, lines 1-18) could have been arranged with three zones (see Yasuyuki, Abstract,

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Constitution) as such an arrangement is well known in the fast reactor art to optimize core flow rates based on fuel burn-up / combustion.

Apparatus claims cover what a device *is*, not what a device *does*. Hewlett-Packard Co. v. Bausch & Lomb Inc., 15 USPQ2d 1525, 1528.

As set forth in MPEP 2115, a recitation in a claim to the material or article worked upon, does not serve to limit an apparatus claim.

Applicant's arguments Applicant's arguments filed 1/30/2006 have been fully considered but they are not persuasive. Applicant is respectfully invited to review said sections of said office actions because applicant has not shown that the references do not teach what the examiner has stated they teach, nor has applicant shown that the examiner's reasoning for and manner of combining the teachings of the references is improper or invalid

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant's arguments are unpersuasive, as applicant has not pointed to any specific structure recited in the claims, which is not found in the references.

Applicant is invited to review section 3 of the 8/30/2005 Office Action as to how the references read on the claims as it appears Applicant continues to argue issues that the Examiner has NOT set forth, for example, Patterson suggesting

three regions in the core and Yasuyaki suggesting each fuel assembly having means to control flow rate.

Applicant also argues (page 8, second paragraph, second to last sentence) that restraint assemblies (18) are not fuel assemblies. This is not persuasive because said restraint assemblies (18) are indeed part of the fuel assemblies as disclosed in, for example, column 3 lines 52+, therefore said restraint assemblies read as part of the fuel assemblies.

Applicant's arguments do not comply with 37 CFR 1.111(c) because they do not clearly point out the patentable novelty which he or she thinks the claims present in view of the state of the art disclosed by the references cited or the objections made. Further, they do not show how the amendments avoid such references or objections.

Applicant's arguments fail to comply with 37 CFR 1.111(b) because they amount to a general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references.

10. Claims 8-12 and 17-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Admitted Prior Art (APA) in view of Church as applied to claims 1-7 and 13-16 above.

Applicant's APA substantially discloses, in paragraphs 2-8 of the specification as filed, specifically paragraph 7, applicant's invention as claimed

including the use of fuel element "inlet" orifices to create different zones/regions of substantially the same flow rate, and that the main coolant flow enters the lower tie plate of the fuel assembly. APA does not appear to explicitly disclose the use of more than 2 regions of different coolant flow, or that the orifices are "detachably coupled" to a lower end of said lower tie plate.

Church sets forth applicants inventive concept as explained above, however Church does not specifically disclose that the means for controlling coolant flow are coupled to a lower end of the lower tie plate of the fuel assembly, because Church discloses a nuclear reactor wherein the main coolant flow is from the top down.

Church teaches it is beneficial, old and well known to detachably couple a flow restrictive device in the entrance of a nuclear fuel assembly as well as other features explained above (e.g., different zones of coolant flow, etc.).

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine the TEACHINGS of Church, i.e. to employ detachably coupled flow limiting devices within the main coolant inlet (i.e. the lower end of the lower tie plate) such that at least three different zones of coolant flow in a nuclear reactor are obtained, in any nuclear reactor core including that set forth by applicant's APA for the benefits of "shaping power distribution" (column 1 line 50) as taught by Church to be old and well known.

11. Claims 1, 2, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baxi (U.S. 4,303,474) in view of JP 06-289178 (Yasuyaki) for the reasons set forth in section 4 of the previous office action dated 8/30/2005, which in turn refers back to section 4 of the previous office action dated 10/15/2004.

Applicant's arguments Applicant's arguments filed 1/30/2006 have been fully considered but they are not persuasive. Applicant is respectfully invited to review said sections of said office actions because applicant has not shown that the references do not teach what the examiner has stated they teach, nor has applicant shown that the examiner's reasoning for and manner of combining the teachings of the references is improper or invalid

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant's arguments do not comply with 37 CFR 1.111(c) because they do not clearly point out the patentable novelty which he or she thinks the claims present in view of the state of the art disclosed by the references cited or the objections made. Further, they do not show how the amendments avoid such references or objections.

Applicant's arguments fail to comply with 37 CFR 1.111(b) because they amount to a general allegation that the claims define a patentable invention

without specifically pointing out how the language of the claims patentably distinguishes them from the references.

12. Claims 1, 2, 13 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Johansson et al (DE 3150477A1) in view of Nakamura et al (U.S. 5,1096,575) for the reasons set forth in section 5 of the previous office action dated 8/30/2005, which in turn refers back to section 5 of the previous office action dated 10/15/2004.

Applicant's arguments Applicant's arguments filed 1/30/2006 have been fully considered but they are not persuasive. Applicant is respectfully invited to review said sections of said office actions because applicant has not shown that the references do not teach what the examiner has stated they teach, nor has applicant shown that the examiner's reasoning for and manner of combining the teachings of the references is improper or invalid

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant's arguments do not comply with 37 CFR 1.111(c) because they do not clearly point out the patentable novelty which he or she thinks the claims present in view of the state of the art disclosed by the references cited or the

objections made. Further, they do not show how the amendments avoid such references or objections.

Applicant's arguments fail to comply with 37 CFR 1.111(b) because they amount to a general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references.

Conclusion

13. Examiner's Note: Examiner has cited particular columns and line numbers in the references as applied to the claims for the convenience of the applicant. Although the specified citations are representative of the teachings in the art and are applied to the specific limitations within the individual claim, other passages and figures may apply as well. It is respectfully requested from the applicant, in preparing the responses, **to fully consider the references in entirety** as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the examiner.

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a. Zmola et al. discloses another method of varying flow in different regions of the nuclear core by the use of tubes to bypass certain regions of the nuclear core to cool other regions.

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b. Carelli teaches the use of assembly orifices to control flow to various regions of the nuclear reactor core to reduce thermal variances and thermal stripping.

c. Otsuji teaches the use of leakage plates in the inlet of fuel assemblies to reduce coolant flow there through.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel L. Greene Jr. whose telephone number is (571) 272-6876. The examiner can normally be reached on Mon-Fri 8:30am - 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack Keith can be reached on (571) 272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

16. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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2006-04-07


for JACK KEITH